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Reports and Notices
4/1987

QUALITY DETERIORATION OF FRESH OCEAN PERCH EXPORTED FROM TROMS TO CONTINENTAL EUROPE

A report on a study trip to markets of
West Germany, Belgium and France

by
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SEC 5-25 (86–02)

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PREFACE

The study and the study trip were carried out with funds kindly made available by the Troms Fisheries Officer from appropriations for North Norway.

The controlled experiments were conducted with ocean perch taken by M/K KVALOYVAER in the Mulegga grounds off Senja and delivered to T 302, Nord-Senja Fiskeindustri A/S, 9398 Botnhamn. Thanks are due to them for their willingness to assist in the implementation of the project.

Helge Haug form Norfra A/S, Tromso, made arrangements for the work to be carried out in Europe and for contacts with importers in West Germany, Belgium and France. Without his input, the project would have been difficult to carry out.

Tromso, February 1987

Gjert Fredriksen

Torbjorn Olsen

Secretary of State | Secrétariat d'État

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Observations of fishing and catch conditions

In order to observe and control the deterioration in quality of the ocean perch that were used in this project, treatment of the fish was followed from the time it was caught on the fishing grounds.

The ocean perch was caught by M/K "Kvaløyvaer" on the Mulegga grounds outside Senja Island. The fish was caught at a depth of about 200 fathoms (about 350 m) with pollock net bottom trawl in place for about 1.5 days.

The fish were stored in saltwater containers on board the vessel, with a ratio of fish to salt water of 60:40. The ocean perch were removed from the nets as they were hauled on board and placed in the containers as quickly as possible.

The ocean perch that had quality defects, either caused by the fishing gear or bottom creatures, were removed. Compared to other fish species, e.g. cod, there were few dead fish in the nets.

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The temperature of the fish was 6-8°C when removed from the nets.

The M/K "Kvaløyvaer" began hauling in the nets on the Mulegga grounds at 12.30 AM and arrived at Botnhamn on Senja Island around 5 PM. Therefore, the maximum age of the fish before packing was 18 hours.

Observations of packing at fisheries plant

Most of the perch are exported fresh, unbled and ungutted from North Norway to the continent.

The fish were packed as soon as possible after unloading from the M/K "Kvaløyvaer" at Botnhamn. The fish were carefully graded with respect to freshness, appearance such as colour and scale loss or other damage from fishing gear. The fish that were exported from Botnhamn had an interior sensory quality corresponding to Grade 9 on the ratings chart used by the Fisheries Directorate's Inspection Office (1), while the exterior sensory quality in the form of colour and lustre of skin and gills corresponded to Grade 8.

The fish were iced in styrofoam boxes, the same kind used for the export of salmon.
The fish weight per box was 25 kg, with an extra weight of 0.5 kg to compensate for any losses. This is too much fish per box for

satisfactory icing. Please see the section on "Controlled trials" where this subject is discussed in greater detail.

The lid was then fastened to the boxes with plastic straps using an automatic strapping machine and stowed on pallets. As the pallets became full they were placed in cold storage until they were loaded into a refrigerator trailer for transport. Before packing, the boxes were marked on the short side either with a stencil or with a roller with inserted letters. The ink was dry before the boxes were handled. Thus, no ink was rubbed out by e.g. wet gloves.

Packing in the plant was done on Friday afternoon and evening from about 2 PM to 8 PM.
Loading into the refrigerator trailer, for reloading at Finnsnes for further transport, was done Friday night from 10 PM to midnight.

This shipment was exported to West Germany and Belgium and arrived there on Monday and Tuesday morning, respectively, so that the transport time was 2.5 and 3.5 days, respectively.

REPORT FROM THE CONTINENTAL MARKET

Visit to the fish market at Cuxhaven

This auction starts at 7 AM.
The fish is either imported fresh, with or without a German importer, or delivered straight from trawlers from other EC countries or Iceland. The fish is iced in standard boxes placed separately on the floor in the market hall, so that it is easy for the buyers to inspect the quality of the fish.

Before the auction starts, the quality of the fish for sale is classified by inspectors from the veterinary authorities according to the following scale:

E - Premium quality
A - Medium quality
B - Lowest quality for human consumption
C - Unacceptable quality for human consumption. Fish of this quality is either discarded or used for animal feed.

The inspector places a note on the various fish shipments showing the quality in question.

On our visit Dec. 12, 1986, most of the fish had been delivered by an Icelandic trawler and the fish was classified as B quality. For example, the ocean perch were of inferior colour, had scale losses, mucus formation and unpleasant gill odour. Some of the fish had deteriorated so badly that the fish meat smelled when cut into fillets. The latter fish was of such low quality that it could not be used fresh according to German quality requirements.

An interview with Ar. Winter of the Martens Company during the auction revealed that they were generally pleased with the quality of the fish imported from Norway. Especially with respect to ocean perch, the lustre and colour of its skin, scale loss and gill appearance/odour were important criteria for determining its quality. In addition, finger pressing was used to evaluate the consistency of the fish. It was also emphasized that a fish weight of 25 kg per box was suitable during the winter season, while in summer there should be no more than 22 kg per box due to the melting of the ice.

Another problem with Norwegian fish was inadequate size grading and that the markings did not always correspond to the content of a box.

We also learned from the discussion with the German importer that they would accept fish of somewhat lower quality on the German market if the price was reduced.

In answer to our question regarding boxes crushed during transport, we were informed that this was no longer a problem since only trucks with thin-walled refrigerators were used.

Bremerhaven

In this city, the fillet company Krüger was visited. This is a business that either imports fresh fish directly from Norway or through A/S Skaarfish Inc.'s sales office in Hamburg.

The managing director, Mr. Krüger, had similar opinions regarding the quality of Norwegian fish on the German market to those registered during the visit to the fish auction at Cuxhaven. In addition, it was emphasized that when the ocean perch was of very inferior quality, the filleted fish meat took on a brownish discoloration after being stored for some time in freezers in the stores.
During this visit we found iced fresh pollock imported from Vestlandet (the West Country) where the size grading did not correspond to the markings on the box.

We also observed fresh haddock imported from Norway that had deteriorated so badly that it could not be used fresh. This fish originated from Nordland and Senja Island and had been brought by rapid transit to Trondheim and then exported from there. We also

observed some fresh fish boxes from Troms that were carelessly marked with drawing ink. This made a poor impression even though the quality of the fish was acceptable.

This company had received some of the ocean perch packed at the various fisheries plants on Senja Island on Friday Nov. 28, 1986. A quality check did not show any mentionable deterioration with respect to its appearance, such as skin colour and lustre and gill mucus formation/odour. The melting of ice in the boxes was also minimal. Discussions regarding the quality of fresh fish at this company, confirmed the impression from the fish market at Cuxhaven that the Germans accept a lower quality than what is accepted in Norway.

Belgium

In this country we visited the companies of Franky Christiaens and Raphel Huysseune at Zeebrügge. These businesses import fresh fish which is either sold as is, or filleted and sold to stores and restaurants.

During the conversation it was determined that this country makes stringent quality demands on fresh fish. These quality demands correspond to those made in Norway.
They emphasized the same factors for a sensory evaluation of the quality of ocean perch as in West Germany.

From the conversation we had the impression that there were few problems with the quality of imported fresh Norwegian fish, but also in this country, size grading/marking on the boxes and too little ice in the boxes during the warm season were brought up as negative points.

A check of a shipment of ocean perch packed at various fisheries plants on Senja Island on Friday Nov. 28, 1986 showed no advanced signs of quality deterioration, except for a somewhat reduced lustre and colour of skin and gills, and that the gill filaments stuck together.

France

We here visited the companies of J.M. Allum and A. Le Boucq located in the fishing village of Boulogne sur Mere. The impressions from these businesses were that particularly stringent demands were made on the quality of fish on this market. In the evaluation of the sensory quality of ocean perch, the emphasis was placed on the same factors as in the other two countries, but here a greater emphasis was placed on colour. This is related to the fact that fresh fish from Norway is resold as whole fresh fish. Only when there are quality problems is the fish filleted.

In the discussion it was revealed that the French importers are generally satisfied with the quality of fresh Norwegian fish. On the negative side it was especially mentioned that the boxes contained too much fish, which can cause freezer burns on the fish. They had received ocean perch from Norway that had brown spots on the skin and were of inferior quality. They felt that this was caused by too much fish and ice in the boxes so that the lids were bulging. When the boxes then were piled on top of each other on pallets, the ice was pressed hard against the fish. This resulted in pressure damage on the fish meat and caused frost damage where the ice pressed against the fish.

They therefore recommended less fish weight in the boxes, more ice at the bottom and a divider, e.g. paper or plastic between the ice and the fish. These recommendations were also based on the fact that the ice at the bottom keeps best and therefore contributes most to keeping the temperature in the box as low as possible. A divider between ice and fish would preserve the colour of the fish better.

A good part of the activities in the two visited businesses consist of repackaging the imported fish in other packages (sizes) and production of fresh fillets for icing. Based on this, they would like the fish packed in smaller packages in Norway, preferably of 5 to 10 kg, which can be sent directly to the fish markets in France. They would prefer to have the fish packed with

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the back facing up, because this shows the colour best for resale.

Otherwise we observed very good production hygiene and order at the fisheries plants we visited in France.

Conclusion

The following conclusions were drawn from our visit to the continent:

1. The importers who were interviewed in all three countries stated that the quality of fresh Norwegian fish was good. In Belgium and France, there were more stringent demands on the quality of the raw material, while in West Germany they can accept a lower quality against a reduction in price. The two first-mentioned countries have quality requirements that correspond to the Norwegian.

2. In particular with respect to ocean perch, the following quality requirements were made:

    1. High degree of freshness.
    2. Good skin colour and lustre, no scale loss or other exterior defects.

3. Odourless gills with good colour with no sticking together of gill filaments.
4. Good consistency.

Among the negative aspects of fresh Norwegian fish exported to the continent, the following were mentioned:

1. The fish weight of 25 kg per box should be reduced even during the winter in order to avoid the danger of the mentioned freezer burns. In addition, plenty of ice should be used in the bottom of the box and a divider in the form of e.g. plastic should be used between fish and ice.

2. The size grading of Norwegian fish is often inadequate. Furthermore, the content of a box does not always correspond to its markings.

CONTROLLED TRIALS

Introduction

For general information on the quality and shelf life of iced fish and sensory, chemical/biochemical and microbiological post mortem changes, please refer to the following literature: H. Blokhus (1), T. Pedersen (2), K. Bakken, J. Gjerde, H. Blokhus and O. R. Brekkan (3) and A. H. H. Huss (4).

For practical reasons, a sensory analysis was carried out in this project with respect to the quality of the raw fish according to a ratings chart used by the Inspection Office of the Fisheries Directorate (1). This chart has a quality grading from 9 - 1, where 9 is the quality denoting the highest quality grade (fish in its natural state). Fish with a quality grade of 6 is the lowest quality permitted for fresh consumption in Norway.

Since the export of fresh ocean perch from North Norway to the continent has grown considerably during the last two years, this fish species was selected for the trials. The plan was to also include other species whenever practically feasible, but at the time the trials were carried out, no other fish was exported from the Senja area in significant quantities.

Fresh ocean perch is exported ungutted and iced in styrofoam boxes. Besides preserving the best possible degree of freshness, emphasis was placed on examining what storage methods on board the fishing vessels and during the trailer transport are least damaging to the fish with respect to the lustre and colour of skin and gills. These are important factors in the quality evaluation of ocean perch in the receiver countries on the continent.

Fish and methods

The treatment of the fish used in the trials was followed from the time it was hauled on board the fishing vessel on the fishing grounds.

The following initial treatment and storage methods were used on board the fishing vessel:

1. Ocean perch stored in a mixture of ice/salt water in a container.
2. Ocean perch stored in salt water in a container.
3. Ocean perch iced in boxes.
4. Ocean perch, bled and iced in boxes.
5. Ocean perch stored in boxes without ice.

The ocean perch were removed from the nets as soon as possible so that all the fish were alive when stored. Since the ocean perch is a tough fish, there were few dead fish in the nets which had been in place about 1.5 - 2 days. In addition, there were no ocean perch of lower quality available from other boats that delivered at Botnhamn on Senja Island that day. This meant that it was not possible to carry out the trial aimed at studying which is the lowest quality of fish that can be packed in order to still preserve sufficient quality upon arrival in the receiver country.

The first fish were stored on board the fishing vessel at about 1 AM and were unloaded at Botnhamn around 5 PM the same day, so that the oldest fish was stored for about 18 hours on board the fishing vessel before packing. The temperature of the fish was between 6.0-8.0^{o}C when hauled on board from the ocean.

The fish were iced in styrofoam boxes belly up and the average weight per fish was 1-2 kg. Fish weights of 20, 22, and 25 kg and 8-10 kg ice were used in the boxes. To compensate for losses an extra weight of 0.5 kg was put in each box.

In one of the test series, the fish were packed in plastic in the ice in order to study how this would affect skin lustre and colour.

Two boxes were iced for each test series, altogether 10 boxes.

The quality of each fish per box at packing at Botnhamn and arrival at Zeebrügge in Belgium was evaluated sensorily according to a ratings chart with the grade figures described earlier. Due to this, an average grade figure was calculated for each test series.

The fish were packed on Friday evening around 8 PM and a sensory quality evaluation was made at Zeebrügge in Belgium the following Tuesday around 12 noon, so that the fish were almost 4.5 days old, including the storage time on board the fishing vessel.

Table 1.

Results of controlled trials with ungutted ocean perch exported to Belgium.

Treatment before packing (Test series:)	Fish weight per box	Sensory analysis Average figures	Signs of deterioration	Remarks
Ocean perch stored in salt water/ice in container on board vessel	22 kg	7/8	Reduced rigor mortis Reduced lustre and colour of skin. Gills somewhat paler (red-brown). Stuck together and a hint mucus formation on skin	No interior deterioration caused by entrails registered
Ocean perch stored in salt water in container on board vessel	25 kg	7/8	"	" Individual fish somewhat softer.
Ocean perch stored in ice in boxes on board vessel	20 kg	7/8	"	"
Ocean perch stored in boxes without ice. Ice wrapped in plastic during packing.	20 kg	7/8	"	" " Somewhat better skin lustre and colour.
Ocean perch, bled and stored in ice in boxes on board vessel	20 kg	7/8	"	" Fish meat somewhat lighter in colour during filleting.

Two boxes were iced for each test series and all the fish were sensorily evaluated upon arrival in Belgium.

Results and remarks

According to the sensory evaluation the ocean perch were just below grade 9 quality during packing, regardless of the test series. Individual fishes showed a somewhat reduced skin lustre and colour, and gill lustre was somewhat paler. Even after careful evaluation, no apparent difference in quality was registered between the fish in the different test series, which was probably due to the fact that the ocean perch were stored only for a short time on board the fishing vessel.

The results of the sensory evaluation upon arrival at Zeebrügge in Belgium for the different test series are shown in Table 1. As the table shows, the general deterioration appeared as reduced rigor mortis, further reduced skin lustre and colour.
The gill filaments were paler, stuck together and there was a hint of mucus coating. No interior deterioration caused by the entrails was registered.

As shown in the table, the ocean perch that were wrapped in plastic in the ice during packing had a somewhat better lustre and colour sharpness than the rest of the fish. As mentioned earlier, these are important factors in the evaluation of the quality of ocean perch on the continent. Based on this and that the results in this trial are based on fish from only two boxes,

a trial on a larger scale should be carried out in order to investigate if they are true.

Different fish weights per box, 20, 22, and 25 kg, were used in the test series.
The boxes with the last-mentioned weight had such a large amount of fish that some were placed almost sideways in the two uppermost layers in the box. If an adequate amount of ice in accordance with the regulations per fish weight is placed in the box, this will cause the lid to bulge, since there is not enough room for all the ice.

This will result in the following:

1. Extra pressure on the fish will occur when such boxes are piled on pallets. This was confirmed since the fish with this box weight were somewhat softer in consistency compared to the fish in the other test series.

2. The gut content of fish lying "on its side" in the uppermost layer can be pressed out and drip down on the fish below. At worst this could reduce the lustre and colour of this fish. Besides, the fish will hardly appear very attractive when such a box is opened.

The trials show that these problems are avoided if a fish weight of 22 kg per box is used. There will then also be a sufficient amount of ice in the box during the warm season. Freezer burns on the fish, as pointed out in France, were not observed in the test, but it must be emphasized that only two boxes were used in this test series.

As mentioned earlier, it was not practically feasible to get hold of the amount of more severely deteriorated ocean perch that was necessary to carry out a trial. This makes it difficult to determine the lower quality limit for packing for export to the continent. It must also be taken into consideration that the ocean perch is ungutted.

First of all, it is obvious that ocean perch that has unpleasant gill odour and mucus formation on gill filaments and skin when packed for export, does not meet the quality requirements for fresh and frozen use in the receiver country after being transported for 3-4 days in ice.

This together with previous experiences of the process of deterioration in fish stored in ice for a period of time, means that premium quality ocean perch (grade 9/8) should not be much older than two days before it is exported from North Norway. Such fish can be transported for 3-4 days to the receiver country and still have a sufficient reserve of quality upon arrival to be

used fresh and frozen, if production takes place immediately. A prerequisite is that the fish were treated and stored according to the regulations.

Weight control of ocean perch upon arrival at Zeebrügge in Belgium showed that losses remained within the assumed weight of 0.5 kg for each box.

Conclusions

The results of the trials showed the following:

1. Fresh ocean perch, with a quality rating of just below 9 during packing on Senja Island in Troms, with insignificant storage time, retained a sufficient reserve of quality upon arrival at the market of Zeebrügge, Belgium, four days later. Furthermore, it was emphasized that the ocean perch should not have a lower quality rating than 8 during packing in North Norway, if the fish are to retain a reserve of quality sufficient for fresh or frozen use upon arrival in the receiver country on the continent.

2. Tests with different fish weights per box showed that 22 kg was suitable with respect to sufficient ice quantity, also during the warm season, with no negative effects on the quality of the fish.

3. Different storage methods on board the fishing vessel did not appear to affect the lustre and colour of the fish upon arrival at the market. One of the reasons could be that the fish were stored for too short a time period.

4. The ocean perch that were wrapped in plastic during icing appeared to keep their lustre and colour better than fish stored directly in the ice.

5. Losses remained within the established limit of 0.5 kg for each box.

References

1. Blokhus, H.: Quality changes in fish raw material. Course in quality control. Department of Quality Control, the Fisheries Directorate of Bergen.

2. Pedersen, T.: Processes and products in the Norwegian fisheries industry. Volume 1. Raw material, equipment, initial treatment, refrigeration. Universitetsforlaget, Oslo, 1980.

3. Annual continuing education course of the Association of Veterinary Hygiene. Control of fish and fish products, Os by Bergen, March 15-18, 1977.

Brekkan, O.R.: Chemical composition of various fish species. Fish as food, pp 36-48.

Gjerde, J.: The normal bacterial flora of fish, pp 52-58.

Gjerde, J.: Bacteriological study of fish and fish products, pp 83-88.

Bakken, K.: Post mortem changes in fish, pp 59-70.

Bakken, K.: Chemical and physical studies of fish and fish products, pp 89-99.

Blokhus, H.: Organoleptic quality control of fish, pp 71-82.

4. Huss, A. H. H.: Fish for consumption. Biology, technology, quality and shelf life.
Danish Veterinary Journal, No. 59, pp 165-175, 221-228 (1976).